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Assessment of the 1998 Newfoundland and Labrador Snow Crab Fishery

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Abstract

Summaries of fishery performance in the Newfoundland and Labrador snow crab, Chionoecetes opilio, fishery are provided for 34 management areas within five NAFO Divisions. Comparative data are provided on yearly landings, effort and CPUE's for individual management areas and fleet components. In 1998 landings reached a record level of 52,070 t, a 13.4% increase over those achieved in 1997. This increase in landings is due to continuing high levels of abundance of commercial-sized animals in most snow crab management areas as well as the prosecution of the fishery in previously unfished areas. In addition to fishery performance statistics, a figure illustrating fishing positions reported from the 1998 logbooks is presented.

Résumé

Les sommaires du rendement de la pêche du crabe des neiges Chionoecetes opilio, à Terre-Neuve et au Labrador, portent sur 34 zones de gestion de cinq divisions de l'OPANO. Ils renferment des données comparatives sur les débarquements annuels, l'effort de pêche et les CPUE pour chacune des zones de gestion et des composantes de la flottille. En 1998, les débarquements ont atteint un niveau sans précédent de 52 070 t, soit une augmentation de 13,4 % par rapport au niveau atteint en 1997. Cette augmentation des débarquements provient des niveaux d'abondance constamment élevés des crabes des neiges de taille commerciale dans la plupart des zones de gestion ainsi que du déroulement de la pêche dans des zones où il n'y avait jamais eu de pêche auparavant. En plus de renfermer des statistiques sur le rendement de la pêche, les sommaires renferment une figure où l'on voit les emplacements de pêche tels qu'ils ont été consignés dans les registres de pêche.

Introduction

The Newfoundland snow crab (Chionoecetes opilio) fishery began in Trinity Bay in 1968. Initially, the catch consisted solely of crabs caught as groundfish gillnet bycatch but within several years there was a directed trap fishery in most inshore areas along the northeast coast of the Island. After this initial areal expansion, the fishery remained relatively stable until the early 1980's when the collapse of the Alaskan king crab fishery triggered a rapid expansion of the fishery both in terms of effort and landings but also in terms of fishing grounds. During this time the fishery was prosecuted by approximately 50 vessels which were restricted to using 800 traps each during an 11-month fishing season. In 1981 Zonal Management was introduced which essentially restricted vessels to exclusively fishing the NAFO Division where licence holders resided.

The mid-1980's represent a turning point for the fishery with a depletion of the crab resource in most areas of NAFO Divisions 3K and 3L and the commencement of fisheries in 2J and 3Ps. In 1985 a supplementary fishery prosecuted by enterprises needing to supplement their income from a failing groundfish fishery was started in 3K. Vessels prosecuting this fishery were restricted to 150 traps and fished the same grounds as the fulltime vessels. A supplementary fishery in 3L commenced in 1987 with the same regulatory regime as that for 3K supplementary fishers.

In 1987 quota management was initiated in all areas of 3L accompanied by a redefinition of fishing seasons for both fleet sectors. Quota management was initiated in 3K in 1988. Depending on the area, fishing by supplementary vessels was restricted to specified seasons in the spring or fall or, in some cases, the quota was split between a fall and a spring season. With the introduction of quota management, areas were redefined and quotas allocated to individual management areas (Fig. 1) by fleet sector. There is no biological basis for the current definition of management areas but rather, they are an attempt to allocate effort proportionally to resource availability. This strategy is an attempt to prevent over exploitation of near-shore areas. In 1989 fulltime vessels were restricted to offshore fishing grounds, and bays, (except Bonavista Bay), were reserved for the supplementary fleet.

The fishery in Labrador began in 1985 and expanded significantly in 1991 with the commencement of fishing activity north of 53:30 latitude. This fishery, centered in Cartwright, is fished exclusively by supplementary vessels and they, like their southern Labrador counterparts, are permitted to fish 300 traps.

In 1994 there were several important changes in the snow crab fishery. In 3K, a dockside monitoring program run by fishers was instituted with a great deal of success. Access to the fishery for supplementary vessels was expanded in 1994. There were now 3 fleet sectors; fulltime, supplementary larger than 40 gross tons in weight and supplementary less than 40 gross tons in weight but having an overall length greater than 35 ft. All three fleet components had designated trap limits, quotas and fishing areas. In order to avoid "gluts" trip limits and/or weekly harvest limits were introduced.

In 1995 dockside monitoring was extended to all NAFO divisions thereby providing reasonable assurance that data on vessel landings were accurate. Monitors were required to initial fishers logbook entries in order to validate them. Also in 1995, an additional fleet of fishers gained access to the snow crab resource. Vessels under 35 ft. LOA were issued temporary seasonal permits and permitted access to the fishery. 360 permits were issued with an allocation of 1800 t and each bay was allocated a quota and number of permits reflective of resource availability. Where too many fishers applied for the number of permits available, a draw system was implemented. Fishing grounds in all NAFO Divisions were extended offshore (outside of 200 n mi in NAFO Division 3LNO).

The 1996 Newfoundland and Labrador snow crab fishery expanded in several ways from the level of activity experienced in 1995. Landings (Table 2) increased to 38,007 t (quota 38,905 t), an 18.8% increase over 1995 landings (31,986 t). Areally, several new fishing areas were occupied in 1996 with excellent results overall in terms of catch rates and quality. Many new participants fished snow crab for the first time as additional temporary permits were issued to fishers using vessels under 35 ft LOA. Enterprise allocations had been adopted by almost all fleet sectors, either partially (3Ps supplementary) or in full (2J, 3K and 3LNO fulltime). In 1996 there were 2,624 enterprises licensed to participate in the snow crab fishery (Table 1).

1996 saw the introduction of a two-tiered pricing structure for snow crab, as well as the implementation of enterprise allocations,(EA's) for almost every harvesting sector. These changes, in tandem with trip limits and weekly catch limits, resulted in a much more regulated and directed fishery than in past years. The two-tiered pricing system was designed to encourage fishers to harvest selectively, crab in excess of 101 mm (4 inches) carapace width (CW). This new pricing structure may have contributed to increased discard mortality in that observers reported that fishers were retaining legal-sized crab under 101 mm CW until they had caught their assigned trip limit of crabs over 101 mm CW. Then, unwanted legal-sized crabs were returned to the water after up to several hours on board the vessel undoubtedly increasing discard mortality. The absence of a competitive fishery with the introduction of individual quotas allowed fishers to take their time and high-grade large crab but at a cost of increased discard mortality.

In 1997 there was a protracted price dispute between fishers and processors. This resulted in a significant delay in opening the fishery. A further difficulty in terms of a timely opening was the issue of how to continue the system of two-tiered pricing without the negative effects of discard mortality experienced during high-grading by the fleet in 1996. Processors stated that the only way to have a financially viable fishery in 1997 was the maintenance of a two-tiered pricing structure. Analysis of data provided by fishery officers and at-sea observers indicated that the potential discard mortality resulting from high-grading practices was alarmingly high in some areas. Resource Management Branch insisted that unless provisions were made to minimize high-grading and attendent discard mortality there would be no 1997 commercial fishery that included a two-tiered pricing policy. In mid-

July, a compromise was reached which allowed for a two-tiered pricing system but disallowed deliberately culling legal-sized under 102 mm CW crabs from the catch. An agreement to this effect was signed by processing and harvesting representatives and the fishery opened, albeit at a much later date than normal.

The fishery continued to expand in terms of licencees, landings and areally. The number of licences issued for the Newfoundland and Labrador region in 1997 increased to 3087, up from 2624 in 1996. The number of licences increased in all NAFO Divisions with the exception of 2J where a disappointing 1996 season for the under 35 ft. temporary permit component of the fleet appears to have caused a reduction in licence applications for the 1997 fishery. Landings increased to 45,903 t (quota 44,915 t), an increase of 20.8% over 1996. Areally, the fishery expanded modestly in 1997 with exploratory fisheries attempting to determine the northern extent of commercial fishing grounds in Labrador (2J) and whether fishing was feasible at depths greater than 550 m on the continental slope of NAFO Division 3K. In both areas special quotas were assigned in order to induce vessels to explore for crabs.

In 1998, the two-tiered pricing system based on crab size remained in place. However, due to an agreement reached between processors and harvesters a 20% tolerence for crab under 102 mm was considered acceptable before the differential price regime kicked in. It appears that this system worked quite well and the problems experienced in recent years in terms of high-grading and attendent discard mortality were largely avoided. The number of licences issued in 1998 was 3,323 (Table 1).

Methods

Fishery Performance - Logbook Data

Raw data on fishers catches, effort (trap hauls) and fishing positions were extracted from logbooks, analysed and summarized by the Informatics and Statistics Branch of the Newfoundland Region of Fisheries and Oceans. While not all logbook entries were usable due to errors or omissions on the part of fishers, most were at least superficially suitable for generating estimates of mean CPUE for each management area and for use in plotting distribution of fishing activity.

Figure 4 illustrates the distribution of fishing effort for 1998. It may be that potential for areal expansion in this fishery is limited to modest northward and continued offshore expansion in NAFO Division 2J and continuing exploratory efforts downslope in all other NAFO Divisions outside 200 n mi, particularly in subareas 3NO.

Observer Data

Data on catches, size-frequency and shell condition were collected by observers from Seawatch Inc. and analysed to determine the degree of comparability between commercial logbook data and research cruise data. CPUE was determined by utilizing the width-weight regression defined by Taylor and Warren (1990) and applying it to observer-supplied measurements of legal-sized crabs.

Results

Fishery Performance

Landings increased in all NAFO Divisions from 1997 levels (Fig. 2). A summary of fishery data by NAFO Division from 1979 to 1998 is presented in Table 2. An overview of CPUE's (Fig. 3) as determined by logbook analyses are presented in Table 3 for each management area and can be summarized as follows:

2J

CPUE increased in 2J by 44%. This increase is principally due to the continued expansion of effort into new fishing grounds in the offshore areas. Inshore, particularly in the northern zone, soft-shelled crab which was a serious problem early in the fishing season in 1997 was much less evident in 1998. In fact CPUE in inshore areas increased markedly in 1998.

3K

Catch rates (CPUE) in Canada Bay (3A) increased by 29% over 1997 levels while those for White Bay (3B) increased by 17%. Green Bay (3C) experienced a severe problem with soft shelled crabs early in the fishing season, necessitating a fishery closure for most of the bay for the entire fishing season. Although many of the Temporary-Seasonal fleet reached their TAC's by fishing the extreme near-shore areas, CPUE values are not comparable with those of 1997. CPUE for Fogo-Twillingate (3D) were unchanged from those experienced in 1997. Catch rates reported for Offshore 3K (4) increased by 36% over 1997 values. Most of the management areas outside of Area 4 were amalgamated into area 3KS in 1997. The resource is comprised of a relatively homogeneous population of crab which are fished by the same vessels yearly. Area 3KN was analysed seperately in 1998 due to the fact that this area was reserved for the supplementary crab fleet only. Yearly comparisons for area 3KS are based on a summary of data for all years. CPUE for 3KS in 1998 was 12.3% higher than in 1997. In fact, catch rates have been relatively stable for the past 6 years. 3KN catch rates were virtually unchanged from those achieved in 1997.

The incidence of Bitter Crab Disease (BCD) infected crabs was extremely high in many areas of NAFO Division 3K. Despite culling of infected crabs conducted by fishers, infected crabs were frequently landed at port as part of the catch. Data supplied by Tavel Ltd. indicate that dock-side monitors recorded 549 instances where BCD-infected crabs were landed as part of the commercial catch. The majority of these landings (93.3%) occurred in 3K during the fall. Also noteworthy is the fact that for the first time, infected crabs were landed in NAFO Divisions 3PS and 4R.

3L

CPUE's for this NAFO Division were, with a few exceptions relatively unchanged from those experienced in 1997. High-grading, which was a severe problem in 1996 and 1997, and which may have skewed catch rates, was greatly reduced in 1998. Catch rates in St. Mary's Bay declined by 35.1% from 1997 values despite a quota reduction of 53%. The snow crab resource in this area appears to be quite depleted.

3Ps

CPUE's remained relatively stable in all areas of 3Ps, with the exception of Fortune Bay (Area 11) where the CPUE increased by 71.6%, and the Halibut Channel (south of 46° - Area 10C) where catch rates increased by 27%. In addition to reported catches from the Newfoundland fleet in 3Ps, fishers from St. Pierre reported landing 360 t of crab from grounds adjacent to the Halibut Channel.

4R

Catch rates for most areas were similar to those achieved in 1997 and remain relatively low compared to the rest of the Island and Labrador. Detailed information on the fishery performance in individual management areas is presented in Tables 4 through 37.

Observer Data

Comparative CPUE data for log and observer-supplied commercial catches are presented in Table 38 . As a result of intensification of biological sampling efforts during 1998 in most management areas the number of samples has greatly increased over 1997 levels.

Discussion

Prognosis

Immediate prospects for the Newfoundland and Labrador snow crab fishery are that for the short-term, abundance and catch rates will remain at relatively high levels in most areas. However, some concern is expressed for the resource prospects in that pre-recruit abundance in some areas is low. In addition, the impact of the relatively high abundance of of BCD-infected crabs, particularly in NAFO Division 3K, while not quantifiable, must be considered as having a negative impact on the resource, however slight.

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Table 1. Summary of licences by NAFO Division for the Newfoundland and Labrador snow crab fishery, 1996-98.

Licence type	NAFO Div. 2J			NAFO Div. 3K			NAFO Div. 3LNO			NAFO Div. 3Ps			NAFO Div. 4R			Total		
	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998*	1996	1997	1998
Fulltime	4	4	4	29	29	29	42	42	44	-	-	-	3	3	11	78	78	88
Supp.	31	31	30	230	230	240	323	323	323	92	92	95	-	-	-	676	676	688
Explor.	-	-	-	-	-	-	4	4	4	-	-	-	56	61	47	60	65	51
Temp.	46	35	70	640	743	723	578	787	796	358	509	596	188	270	311	1810	2344	2496
Total	81	70	104	899	1002	992	947	1156	1167	450	601	691	247	334	369	2624	3163	3323

* In Div. 4R (Zone 13) 43 crab licences (not included) were issued to Quebec fishers and 6 to Newfoundland fishers.

Table 2. Summary of performance of the Newfoundland snow crab fishery, 1979-98.

Year	Div. 2J		Div. 3K		Div. 3LMNO		Div. 3Ps		Div. 4R		Total Newfoundland	
	Catch (t)	('000 trap) hauls	Catch (t)	('000 trap) hauls	Catch (t)	('000 trap) hauls	Catch (t)	('000 trap) hauls	Catch (t)	('000 trap) hauls	Catch (t)	('000 trap) hauls
1979	-	-	788	79	9,426	666	-	-	-	-	10,214	745
1980	-	-	628	58	8,190	527	-	-	-	-	8,818	585
1981	-	-	1,202	94	12,636	808	-	-	-	-	13,838	902
1982	-	-	2,505	215	10,673	762	-	-	-	-	13,178	977
1983	-	-	4,868	520	6,188	745	-	-	-	-	11,056	1,265
1984	-	-	5,080	606	4,476	679	-	-	-	-	9,556	1,285
1985	311	20	3,953	670	2,605	496	602	-	-	-	7,471	1,186
1986	467	40	3,958	917	3,467	490	651	-	-	-	8,543	1,447
1987	256	30	2,656	730	3,083	552	596	199	-	-	6,591	1,511
1988	451	48	2,565	656	5,903	641	856	231	-	-	9,775	1,576
1989	523	50	2,359	477	4,985	653	529	112	-	-	8,396	1,293
1990	645	51	4,253	334	5,211	608	596	119	-	-	10,705	1,112
1991	989	66	7,675	523	6,394	688	176	31	-	-	15,234	1,308
1992	1,529	110	7,295	551	6,652	519	121	10	-	-	15,597	1,190
1993	2,275	161	9,760	595	8,979	554	704	61	-	-	21,718	1,371
1994	2,978	295	11,039	869	12,237	847	1,590	96	655	119	28,499	2,226
1995	3,178	402	12,245	1,065	13,790	806	1,853	185	920	159	31,986	2,617
1996	3.090	303	14,185	1,163	16,847	1,110	3,052	184	833	141	*38,007	2,909
1997	3,166	266	14,830	1,257	22,185	1,499	4,753	250	967	269	*45,901	3,541
1998	4,061	280	16,788	1,244	23,533	1,462	6,624	320	1,064	213	*52,070	3,519

* In addition to a total catch of 38,007 t in 1996, 45,901 t in 1997, and 52,070 t in 1998, a catch of 1,032 t in 1996, 708 t in 1997, and 720 t in 1998 was caught in 4R (co-management area 13) by Quebec-based fishers.

Table 3. Summary by management area of the comparison of 1996-97 and 1997-98 snow crab fishery data. Numbers represent the percentage change.

	Landings		Effort		CPUE	
Area	1997 vs 1996	1998 vs 1997	1997 vs 1996	1998 vs 1997	1997 vs 1996	1998 vs 1997
2J						
North	-15	-	-32	-	+24	-
South	+18	-	-18	-	+49	-
3K						
3A	+69	-15	+60	-34	+6	+29
3B	+40	-5	+77	-19	-21	+17
3C	-36	-27	+6	-	-39	-
3D	-11	-6	-8	-9	-3	+3
3Ks	+11	+6	+7	+15	+4	+10
3Kn	-27	+41	-29	+33	+3	+6
4	+4	+6	-2	-2	+6	+8
3L						
5A	+10	-5	+25	-9	-12	+4
5B	-8	+13	+16	+11	-21	-
5Bx	+81	-	+57	-	+15	-
6A	0	-7	-8	-23	+8	+21
6B	+52	0	+68	-18	-10	+21
6C	+25	+14	+27	+15	-2	0
7A	+21	+24	+28	+24	-6	0
7B	+7	-	+8	-	-1	-
7C	-4	-	+4	-	-8	-
7BC	+62	-	+9	-	+49	-
8A	+153	-19	+182	-33	-10	+20
9A	-45	-38	-48	-4	+7	-35
3Ps						
10A	+53	+28	+42	+22	+8	+5
10C	+50	+18	+36	-7	+10	+27
11	+138	-	+129	-	+4	+69

This table was constructed from fishery performance information collated from vessel logbooks in each of the management areas. The comparisons made based on CPUE may not accurately reflect abundance.

Table 4. Area 2J - Southern Labrador.

Year	Total landings		Total effort		CPUE (kg/trap)		Quota (t)	
	(t)	(Supp.)	('000s)	(Supp.)	Full	(Supp.)	Full	(Supp.)
1985	311		20.5		15.2			
1986	467		39.6		11.8			
1987	256		30.1		8.5			
1988	451		48.5		9.3		926	
1989	523		50.3		10.4		920	
1990	645		51.2		12.6		920	
1991	917		59.2		15.5		920	
1992	1077	(317)	76.0	(22.5)	14.2	(14.4)	720	(300)
1993	1331	(455)	91.6	(31.6)	14.7	(14.4)	860	(440)
1994	1466	(491)	130.2	(54.6)	12.9	(9.0)	860	(440)
1995	1384	(779)	175.2	(111.3)	10.0	(7.0)	600	(760)
1996	1043	(503)	129.3	(59.2)	11.9	(8.5)	500	(600)
1997	1439	(867)	111.6	(77.4)	14.8	(11.2)	500	(825)
1998	505	-	24.5	-	20.6	-	500	-

Exploratory fishing >300 fms resulted in a catch of 16 t and 142 t for fulltime and supplementary fishers (CPUE = 7.6 and 12.9).

Table 5. Area 2JS extended (east of 53°30'W).

Year	Total landings		Effort		CPUE (kg/trap)		Quota (t)	
	(t)	(Supp)	('000s)	(Supp)	Full	(Supp.)	Full	(Supp.)
1994	330		25.8		12.8		300	
1995	334		40.7		8.2		300	
1996	331		28.1		11.8		300	
1997	178	(123)	13.3	(10.0)	15.5	(12.3)	0	(0)
1998	373	(305)	27.2	(23.1)	16.2	(13.2)	0	(0)

An area south of 54°40'N and >100 n mi offshore was fished in 1996 resulting in a catch of 91 t (CPUE 12.2) by fulltime fishers and a catch of 261 t (CPUE 9.0) by supplementary fishers. In 1998 100 t was allocated and 100 t caught (CPUE = 13.5).

Table 6. Area 2J - Northern Labrador.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1991	72	6.6	10.9	500
1992	452	45.7	9.9	400
1993	984	80.0	11.8	1000
1994	1182	168.9	7.0	1300
1995	1460	203.3	7.2	1400
1996	1364	172.4	7.9	1475
1997*	1459	148.9	9.8	1325

In 1998 supplementary fishers caught 2519 t (quota 2,150 t) in 2J (CPUE = 15.8).

*An experimental quota of 100 t in 1997 and 500 t in 1998 was allocated to Torngat Fish Processors Co-op in an area N of 54°40' latitude which resulted in a catch of 90 t (CPUE = 12.2 kg/trap) and 406 t (CPUE = 9.0 kg/trap) respectively.

Table 7. Area 3A - Canada Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1992	82	8.2	10.0	50
1993	104	10.0	10.4	75
1994	112	19.6	5.7	100
1995	136	34.0	4.0	150
1996	140	26.4	5.3	200
1997*	237	42.3	5.6	250
1998	201	27.9	7.2	350

*Line of latitude moved south from 50°30'N to 50° 22'N.

Table 8. Area 3B - White Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1979	297	33.0	9.0	
1980	254	24.7	10.3	
1981	552	39.1	14.1	
1982	1153	84.2	13.7	
1983	2474	240.2	10.3	
1984	3048	354.4	8.6	
1985	1336	262.0	5.1	
1986	1353	397.9	3.4	
1987	418	154.8	2.7	
1988	387	184.3	2.1	750
1989	206	98.1	2.1	250
1990	182	41.4	4.4	150
1991	-	5.0	-	200
1992	209	26.1	8.0	200
1993	377	44.4	8.5	300
1994	476	58.8	8.1	400
1995	408	48.0	8.5	400
1996	667	68.8	9.7	700
1997	937	121.7	7.7	900
1998	889	98.8	9.0	800

Table 9. Area 3C - Green Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1979	491	46.3	10.6	
1980	374	37.8	9.9	
1981	650	54.6	11.9	
1982	1352	130.0	10.4	
1983	537	88.0	6.1	
1984	502	76.1	6.6	
1985	476	80.7	5.9	
1986	938	246.8	3.8	
1987	303	112.2	2.7	
1988	255	127.5	2.0	400
1989	243	69.4	3.5	180
1990	260	47.3	5.5	280
1991	407	59.9	6.8	400
1992	416	47.8	8.7	400
1993	606	60.0	10.1	500
1994	611	67.9	9.0	600
1995	689	74.1	9.3	750
1996	984	175.7	5.6	1000
1997	634	186.5	3.4	750
1998*	460	-	-	450

* closed to supplementary fishers.

Table 10. Area 3D - Fogo-Twillingate.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1983	1857	191.4	9.7	
1984	1463	164.4	8.9	
1985	1063	141.7	7.5	
1986	895	165.7	5.4	
1987	424	83.1	5.1	
1988	800	163.3	4.9	300
1989	410	75.9	5.4	400
1990	709	77.1	9.2	600
1991	1593	156.2	10.2	1300
1992	1183	113.8	10.4	1200
1993	1297	107.2	12.1	1200
1994	1169	111.3	10.5	1200
1995	1419	168.9	8.4	1400
1996	1476	220.3	6.7	1550
1997	1314	202.2	6.5	1550
1998	1231	183.7	6.7	1440

Table 11. Area 4 - 3K offshore.

Year	Total landings		Total effort		CPUE (kg/trap)		Quota (t)	
	(t)	(Supp.)	('000s)	(Supp.)	Full	(Supp.)	Full	(Supp.)
1984	67		11.0		6.1			
1985	225		40.2		5.6			
1986	772		108.7		7.1			
1987	594		108.0		5.5			
1988	1123		184.1		6.1		1900	
1989	1534		229.0		6.7		1600	
1990	3102		168.6		18.4		3300	
1991	5579	(1060)	378.4	(90.6)	15.7	(11.7)	4300	(1400)
1992	5405	(2030)	407.8	(175.0)	14.5	(11.6)	3100	(1700)
1993	5772	(2154)	351.0	(137.0)	16.9	(15.7)	3200	(1800)
1994	5662	(2269)	363.8	(173.2)	17.8	(13.1)	3200	(1800)
1995	5805	(3515)	432.2	(283.5)	15.4	(12.4)	2300	(3200)
1996	5506	(3197)	443.5	(290.6)	15.1	(11.0)	2300	(3200)
1997	5709	(3345)	435.8	(290.6)	13.6	(12.2)	2200	(3500)
1998	6055	(4734)	426.4	(355.9)	18.5	(13.3)	1315	(4850)

Table 12. Area 3Ks.

Year	Total landings		Total effort		CPUE (kg/trap)		Quota (t)	
	(t)	(Supp.)	('000s)	(Supp.)	Full	(Supp.)	Full	(Supp.)
1993	868	-	51.4	-	16.9	-	750	-
1994	3009	(2002)	218.0	(144.0)	13.7	(13.9)	835	(1665)
1995	3788	(2485)	264.9	(172.6)	14.2	(14.4)	1400	(2600)
1996	3981	(2598)	272.7	(183.0)	15.3	(14.2)	1400	(2600)
1997	4432	(2890)	291.6	(190.1)	15.4	(15.2)	1550	(2900)
1988	5578	(3187)	334.0	(195.5)	17.3	16.3	2435	(3100)

Table 13. Area 3KN, North of. 50°40' in 3KBC (supp.).

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1996	1431	126.6	11.3	700
1997*	1041	89.7	11.6	700
1998*	1464	119.0	12.3	1000

*Permits were issued to both fulltime and supplementary crab fishers to fish in outer northern 3K at depths >300 fms, resulting in additional catches of 128 t and 398 t respectively in 1997 and 287 t and 623 t respectively in 1998 (CPUE 12.5 and 11.0 kg/trap).

Table 14. Area 5A - Bonavista Bay.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1979	1586		172.4		9.2			
1980	1905		192.4		9.9			
1981	1376		172.0		8.0			
1982	905		96.3		9.4			
1983	1101		203.9		5.4			
1984	1327		250.4		5.3			
1985	728		251.0		2.9			
1986	648		140.9		4.6		500	
1987	602		84.8		7.1		500	
1988	844	(109)	89.6		8.2		600	(100)
1989	959	(320)	75.2		8.5		600	(300)
1990	1072	(416)	91.1	(37.8)	12.3	(11.0)	600	(300)
1991	1102	(479)	102.8	(41.7)	10.2	(11.5)	650	(350)
1992	1160	(468)	82.6	(35.2)	14.6	(13.3)	650	(350)
1993	1431	(526)	99.1	(41.1)	15.6	(12.8)	700	(400)
1994	1550	(984)	101.2	(70.3)	18.3	(14.0)	500	(600)
1995	1106	(736)	78.4	(52.9)	14.5	(13.9)	375	(725)
1996	-	(1006)	-	(97.7)	-	(10.3)	-	(1000)
1997	-	(1111)	-	(122.1)	-	(9.1)	-	(1000)
1998	-	(1054)	-	(110.9)	-	(9.5)	-	(1000)

Table 15. Area 5B - Outer Bonavista Bay.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1990	161	(161)	36.6	(36.6)	-	(4.4)	200	(200)
1991	479	(479)	41.6	(41.6)	-	(11.5)	350	(350)
1992	769	(433)	48.6	(27.9)	16.2	(15.5)	400	(400)
1993	1277	(826)	78.6	(47.5)	14.5	(17.4)	500	(500)
1994	1562	(868)	105.0	(57.5)	14.6	(15.1)	700	(600)
1995	1445	(881)	89.2	(56.8)	17.5	(15.5)	500	(800)
1996	1923	(1275)	141.0	(96.6)	14.6	(13.2)	600	(1200)
1997	-	(1773)	-	(1642)	-	(10.8)	-	(1700)
1998	-	(2008)	-	(182.5)	-	(11.0)	-	(1950)
1997	-	(1773)	-	(1642)	-	(10.8)	-	-
1998	-	(2008)	-	(182.5)	-	(11.0)	-	(1950)

Table 16. Area 5B - extended.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1994	697	(431)	72.5	(49.0)	11.3	(8.8)	200	(400)
1995	592	(237)	31.5	(12.5)	18.7	(19.0)	400	(400)
1996	827	(388)	53.5	(24.6)	15.2	(15.8)	500	(500)
1997	1500	(779)	83.8	(41.4)	17.2	(18.8)	750	(750)

In 1998 Area 5B was combined into Area 3L.

Table 17. Area 6A - Inner Trinity Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1979	67	4.2	16.0	
1980	59	4.6	12.9	
1981	110	14.9	7.4	
1982	65	10.7	6.1	
1983	72	12.0	6.0	
1984	17	2.5	6.9	
1985	19	5.0	3.8	
1986	18	3.5	5.1	
1987	44	9.0	4.9	100
1988	98	22.8	4.3	75
1989	180	35.3	5.1	200
1990	232	38.0	6.1	200
1991	259	46.3	5.6	200
1992	177	21.6	8.2	200
1993	380	43.2	8.8	275
1994	490	48.0	10.2	400
1995	583	43.8	13.3	525
1996	689	83.0	8.3	700
1997	690	76.7	9.0	600
1998	644	59.1	10.9	600

Table 18. Area 6B - Conception Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1979	464	28.8	16.1	
1980	869	56.4	15.4	
1981	502	43.7	11.5	
1982	694	60.9	11.4	
1983	564	64.1	8.8	
1984	333	52.0	6.4	
1985	139	26.2	5.3	
1986	193	32.7	5.9	
1987	227	24.7	9.2	
1988	499	45.0	11.1	
1989	476	78.0	6.1	500
1990	314	62.8	5.0	500
1991	383	100.8	3.8	400
1992	304	49.8	6.1	300
1993	309	44.1	7.0	300
1994	416	33.5	12.4	300
1995	516	37.1	13.9	525
1996	595	47.6	12.5	650
1997	904	80.0	11.3	800
1998	899	65.6	13.7	850

Table 19. Area 6C - Eastern Avalon

	Total landings		Total effort		CPUE (kg/trap)		Quota (t)	
Year	(t)	(Supp.)	('000s)	(Supp.)	Full	(Supp.)	Full	(Supp.)
1979	7632		436.1		17.5			
1980	5065		242.3		20.9			
1981	7607		484.5		15.7			
1982	3368		253.2		13.3			
1983	801		108.2		7.4			
1984	312		55.7		5.6			
1985	113		24.6		4.6			
1986	144		26.7		5.4			
1987	172		29.7		5.8			
1988	751		72.2		10.4		300	(300)
1989	661		68.1		9.7		400	(300)
1990	850	(231)	102.0	(36.1)	9.4	(6.4)	600	(400)
1991	1090	(391)	134.7	(61.1)	9.5	(6.4)	600	(400)
1992	1078	(428)	102.2	(47.6)	11.9	(9.0)	600	(400)
1993	1541	(839)	88.5	(55.2)	21.1	(15.2)	700	(500)
1994	2024	(1391)	110.5	(79.9)	20.7	(17.4)	700	(900)
1995	2128	(1658)	120.9	(97.0)	19.7	(17.1)	425	(1512)
1996*	2432	(2152)	155.9	(141.6)	19.6	(15.2)	300	(1600)
1997	-	(3028)	-	(197.9)	-	(15.3)	-	(2600)
1998	-	(3447)	-	(226.8)	-	(15.2)	-	(2875)

* A quota of 300 t was allocated to the temporary seasonal fishers for Eastern/Southern Avalon in 1996 which resulted in a catch of 291 t (CPUE 15.2)

Table 20. Area 7A - Outer Trinity Bay.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1979	569		57.5		9.9			
1980	494		58.1		8.5			
1981	178		24.7		7.2			
1982	95		13.8		6.9			
1983	107		20.2		5.3			
1984	202		38.1		5.3			
1985	113		27.6		4.1			
1986	165		56.9		2.9			
1987	140		36.8		3.8			
1988	200		39.2		5.1			
1989	251		51.2		4.9		300	
1990	245		40.2		6.1		400	
1991	397		60.2		6.6		400	
1992	497	(176)	40.5	(13.1)	11.7	(13.4)	250	(150)
1993	751	(350)	52.5	(26.3)	15.3	(13.3)	300	(200)
1994	1066	(800)	68.0	(50.0)	14.8	(16.0)	300	(500)
1995	1060	(905)	70.7	(60.7)	15.5	(14.9)	200	(700)
1996	994	(814)	81.8	(69.0)	14.1	(11.8)	150	(800)
1997	-	(1202)	-	(104.5)	-	(11.5)	-	(1200)
1998	-	(1485)	-	(129.1)	-	(11.5)	-	(1400)

Table 21. Area 7B - Offshore Avalon (Shoal Patch).

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1981	1840		65.7		28.0			
1982	4194		218.4		19.2			
1983	1662		151.1		11.0			
1984	431		47.9		9.0			
1985	31		6.0		5.2			
1986	-		-		-			
1987	-		-		-			
1988	298		39.7		7.5			
1989	519		68.3		7.6			
1990	701		60.4		11.6		500	
1991	1371		114.3		12.0		1300	
1992	1758		102.2		17.2		1300	
1993	1730		82.8		20.9		1500	
1994	2383	(544)	118.1	(28.8)	20.6	(18.9)	1800	(200)
1995	2514	(841)	129.0	(47.8)	20.6	(17.6)	1700	(800)
1996	2638	(960)	151.4	(58.2)	18.0	(16.5)	1700	(800)
1997	2825	(1015)	164.2	(62.3)	17.7	(16.3)	1800	(1000)

In 1998 Area 7B was combined into Area 3L.

Table 22. Area 7C - Downing Basin.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1982	114		7.3		15.6			
1983	733		61.1		12.0			
1984	397		40.9		9.7			
1985	-		-		-			
1986	-		-		-			
1987	-		-		-			
1988	-		-		-			
1989	-		-		-			
1990	-		-		-			
1991	-		-		-			
1992	147		13.7		10.7		200	
1993	264		14.4		18.3		300	
1994	746		46.6		16.0		400	
1995	855	(374)	43.3	(20.4)	21.0	(18.3)	400	(300)
1996	833	(350)	49.8	(22.2)	17.5	(15.8)	450	(300)
1997	796	(290)	51.7	(19.7)	15.9	(14.7)	500	(300)

In 1998 Area 7C was combined into Area 3L.

Table 23. Area 7Bc - Shoal Patch/Downing Basin extended.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1995	539	(367)	29.8	(20.4)	18.2	(18.0)	175	(325)
1996	1237	(700)	69.6	(37.8)	16.9	(18.5)	550	(850)
1997	1581	(917)	79.4)	(44.7)	19.1	(20.5)	650	(950)

In 1998 Area 7Bc was combined into Area 3L.

Table 24. Area 3LMNO - Outside 200 miles.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1995	1370	(934)	69.2	(47.4)	19.9	(19.7)	450	(1050)
1996	1552	(1232)	149.2	(116.2)	9.7	(10.6)	300	(1200)
1997	2509	(1917)	161.9	(122.1)	15.1	(15.7)	550	(1150)
1998*	1769	(1206)	85.5	(59.1)	21.3	(20.4)	550	(1150)

* A quota of 300 t was allocated to vessels 65-100 ft and 500 t for special licences resulting in a catch of 191 and 638 t respectively. (CPUE = 19.2). Exploratory fishing in 3N resulted in a catch of 155 t (CPUE = 8.8)

Table 25. Area 3L - Outside 170 and inside 200 n miles.

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1996	502	(353)	28.2	(19.7)	17.5	(17.9)	200	(400)
1997	1407	(865)	105.0	(19.7)	17.5	(17.9)	200	(400)
1998	1491	(913)	68.4	(40.0)	20.5	(22.8)	600	(900)

Table 26. Area 8A - Southern Avalon (inside 50 miles).

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1980	292		13.8		21.1			
1981	854		45.2		18.9			
1982	732		49.8		14.7			
1983	955		99.5		9.6			
1984	1068		135.2		7.9			
1985	627		87.1		7.2			
1986	1267		117.3		10.8			
1987	1129		92.5		12.2			
1988	2347		223.5		10.5		2300	
1989	1640		197.6		8.3		2400	
1990	448		65.9		6.8		2000	
1991	624		115.6		5.4		800	
1992	456	(276)	45.3	(25.1)	8.9	(11.0)	200	(200)
1993	855	(412)	85.1	(38.5)	9.5	(10.7)	400	(300)
1994	819	(303)	55.2	(20.3)	14.8	(14.9)	400	(800)
1995	-	(502)	-	(30.4)	-	(16.5)	-	(563)
1996	-	(464)	-	(25.4)	-	(18.3)	-	(700)
1997	-	(1174)	-	(71.6)	-	(16.4)	-	(1000)
1998	949	(563)	48.2	(28.4)	-	(19.8)	400	(600)

Table 27. Area 8B - Southern Avalon (outside 50 miles).

Year	Total landings (t)	(Supp.)	Effort ('000s) Total	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1995	26		1.9		13.4		200	
1996	295		18.0		16.4		300	
1997	948	(551)	52.1	(29.9)	17.9	(18.4)	400	(600)
1998	949	(563)	48.2	(28.4)	19.6	19.8	400	(600)
1997	948	(551)	52.1	(29.9)	17.9	(18.4)	400	(600)
1998	949	(563)	48.2	(28.4)	19.6	(19.8)	400	(600)

Table 28. Area 3L (5Bx + 7B + 7C + 7Bc).

Year	Total landings (t)	(Supp.)	Total effort ('000s)	(Supp.)	CPUE (kg/trap) Full	(Supp.)	Quota (t) Full	(Supp.)
1998	6725	(3035)	384.3	(133.1)	18.4	(22.8)	3700	(3035)

Table 29. Area 9A - St. Mary's Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1979	8	1.2	6.7	
1980	-	-	-	
1981	168	11.2	15.0	
1982	506	48.2	10.5	
1983	274	37.5	7.3	
1984	264	35.2	7.5	
1985	164	23.1	7.1	
1986	102	21.3	4.8	
1987	4	0.7	5.8	
1988	266	36.9	7.2	
1989	217	29.7	7.3	200
1990	267	31.0	8.6	200
1991	317	27.8	11.4	300
1992	306	27.1	11.3	300
1993	441	36.8	12.0	300
1994	484	29.7	16.3	400
1995	515	35.0	14.7	525
1996	530	58.2	9.1	525
1997	294	30.3	9.7	425
1998	183	29.0	6.3	200

Table 30. Area 9B - St. Mary's Bay (west of Cape Pine).

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1995	39	-	-	200
1996	39	3.6	10.8	200
1997	443	23.1	19.2	400
1998	763	35.8	21.3	700

Table 31. Area 10A - Placentia Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1983	43	3.1	13.9	
1984	175	18.6	9.4	
1985	385	44.8	8.6	
1986	930	91.2	10.2	
1987	596	198.7	3.0	600
1988	856	231.4	3.7	600
1989	529	112.6	4.7	600
1990	596	119.2	5.0	600
1991	176	31.4	5.6	600
1992	121	11.4	10.6	400
1993	603	55.3	10.9	400
1994	895	57.7	15.5	400
1995	700	44.3	15.8	625
1996	1039	53.3	19.5	1000
1997	1591	78.8	20.2	1500
1998	2040	96.2	21.2	1700

Table 32. Area 10B - Outer Placentia Bay (between 46°N and 46°30'N).

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1996	759	37.4	20.3	750
1997	1011	48.6	20.8	1000
1998	1300	58.8	22.1	1300

Table 33. Area 10C - Halibut Channel (south of 46°).

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1994	289	14.0	20.6	250
1995	818	44.2	18.5	800
1996	747	41.0	18.2	750
1997	1124	58.5	19.2	1000
1998	1331	54.5	24.4	1300

Table 34. Area 10D - Halibut Channel (south of 46°45').

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1998	608	29.0	21.0	600

Table 35. Area 11 - Fortune Bay.

Year	Total landings (t)	Effort ('000s)	CPUE (kg/trap)	Quota (t)
1993	101	10.9	93	100
1994	406	35.0	11.6	200
1995	335	59.8	5.6	575
1996	292	21.2	13.8	350
1997*	694	48.5	14.3	700
1998*	1168	48.3	24.2	1100

* A quota of 200 t was allocated to fishers in Area 11 west of Pass Is. resulting in a catch of 61 t (CPUE = 4.0) in 1997 and 177 t in 1998 (CPUE = 5.0).

Table 36. Area 4R/3Pn west/south coast (fulltime).

Area	Year	Quota (t)	Landings (t)	Effort ('000 tr. h)	CPUE (kg/tr. h)
Area 13	1994	889	870 (334)[1]	61.9[2]	5.4[2]
	1995	889	883 (198)	29.6	6.7
	1996	1111	1071 (39)	7.4	5.3
	1997	931	895 (187)	39.8	4.7
	1998	838	838 (118)	-	3.8
South of Table Point + 3Pn	1994	-	157	-	3.8
	1995	225	205	-	2.6
	1996	645	454[3]	126.1	3.6
	1997	645	314	108.3	2.9
	1998	645	452	-	3.6
Bay of Islands	1994	110	106	16.6	6.3
	1995	110	110	16.9	6.5
	1996	80	57	13.9	4.1
	1997	80	29	11.6	2.5
	1998	80	43	-	-
St. George's Bay	1994	65	58	8.4	7.1
	1995	65	64	7.9	8.1
	1996	50	45	5.6	8.1
	1997	45	44	6.7	6.6
	1998	45	48	-	6.0

1 Both Quebec and Newfoundland vessels landed in the other Province and the incidence varies. Landings in Newfoundland in brackets ( ).

2 Effort and CPUE are for Newfoundland vessels only.

3 1984 t landed in Quebec

Table 37. Area 4R/3Pn - west/south coast (temporary).

Area	Year	Quota (t)	Landings (t)	Effort ('000 tr. h)	CPUE (kg/tr. h)
A. Lapolle Bay	1995	15	13	-	-
	1996	39	8	3.1	2.6
	1997	40	0	-	-
	1998	10	8	-	-
B. Cape Ray-Johnsons Cove	1995	10	2	-	-
	1996	20	4	0.9	4.4
	1997	20	7	1.3	5.4
	1998	20	6	-	-
C. Johnsons Cove-Cape St. George	1995	25	24	-	-
	1996	66	63	9.4	6.7
	1997	170	128	27.8	4.6
	1998	170	146	-	-
D. Cape St. George-Bear Head	1995	25	25	-	-
	1996	69	62	10.8	5.7
	1997	70	31	5.5	5.6
	1998	70	53	-	-
E. Bear Head-Cape St. Gregory	1995	50	50	-	-
	1996	81	31	11.0	2.8
	1997	80	16	5.0	3.2
	1998	60	3	-	-
F. Inside Bay of Islands	1995	-	-	-	-
	1996	30	24	7.5	3.2
	1997	30	5	2.8	1.8
	1998	10	4	-	-
G. Cape St. Gregory-Broom Point	1995	60	59	-	-
	1996	140	140	15.2	9.0
	1997	140	158	16.8	9.4
	1998	140	143	-	-
H. Broom Point-Table Point	1995	50	27	-	-
	1996	69	36	5.1	7.0
	1997	70	48	12.4	3.9
	1998	60	40	-	-
Area 13 (West Nfld. vessels)	1995	-	-	-	-
	1996	60	37	7.7	4.8
	1997	0	0	-	-
	1998	0	0	-	-
TOTALS	1995	235	200		
	1996	574	405		
	1997	620	393	-	-
	1998	540	403		

Table 38. Comparison of observer and logbook data for the snow crab fishery, 1995-98.

Area	CPUE 1995			CPUE 1996			CUPE 1997			CPUE 1998		
	Logbook	Observer	# traps sampled	Logbook	Observer	# traps sampled	Logbook	Observer	# traps sampled	Logbook	Observer	# traps sampled
2JS	10.0	11.3	12	11.9	5.2	1	-	-	-	-	-	-
2JSX	-	-	-	11.8	20.0	4	13.4	14.6	1	13.7	16.0	30
2JN	-	-	-	6.5	10.2	6	-	-	-	-	-	-
3A	4.0	3.3	1	-	-	-	-	-	-	-	-	-
3B	8.5	14.0	3	-	-	-	7.7	9.9	1	9.0	13.3	11
3C	9.3	18.2	1	-	-	-	-	-	-	-	-	-
3D	-	-	-	-	-	-	6.5	7.4	11	-	-	-
4	15.4	21.2	68	15.1	2.9	1	13.1	13.8	12	14.2	31.6	12
3KS	23.1	14.3	13	16.2	14.6	2	15.2	10.8	22	16.7	11.4	126
3KN	-	-	-	-	-	-	11.6	13.9	3	12.3	17.9	27
3LNO	-	-	-	-	-	-	-	-	-	20.7	19.6	142
5A	-	-	-	-	-	-	9.1	9.6	18	-	-	-
5B	17.5	19.1	6	14.6	6.8	1	-	-	-	10.8	13.5	4
5BX	18.7	19.3	6	-	-	-	17.9	27.3	2	-	-	-
6C	19.7	11.2	3	-	-	-	15.3	16.4	1	15.2	26.6	45
7A	15.5	19.7	4	-	-	-	11.5	26.8	2	11.5	32.7	6
7B	20.6	22.4	55	18.0	27.8	1	-	-	-	-	-	-
8A	-	-	-	-	-	-	16.4	26.4	2	19.7	22.4	6
9A	-	-	-	-	-	-	9.7	17.3	1	-	-	-
9B	-	-	-	-	-	-	19.2	25.1	2	21.3	40.2	9

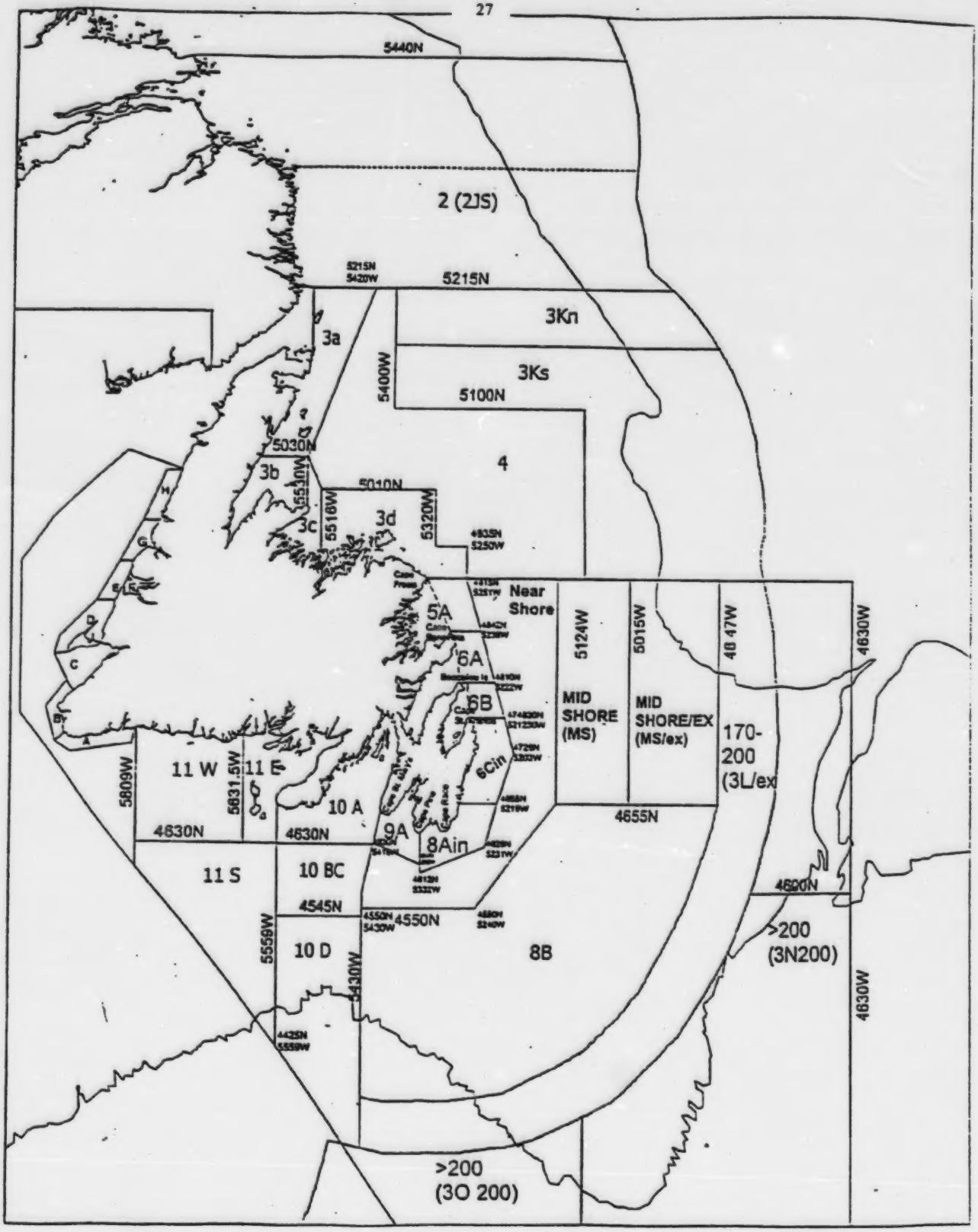

Figure 1. Snow crab management areas for Newfoundland and Labrador, 1998.

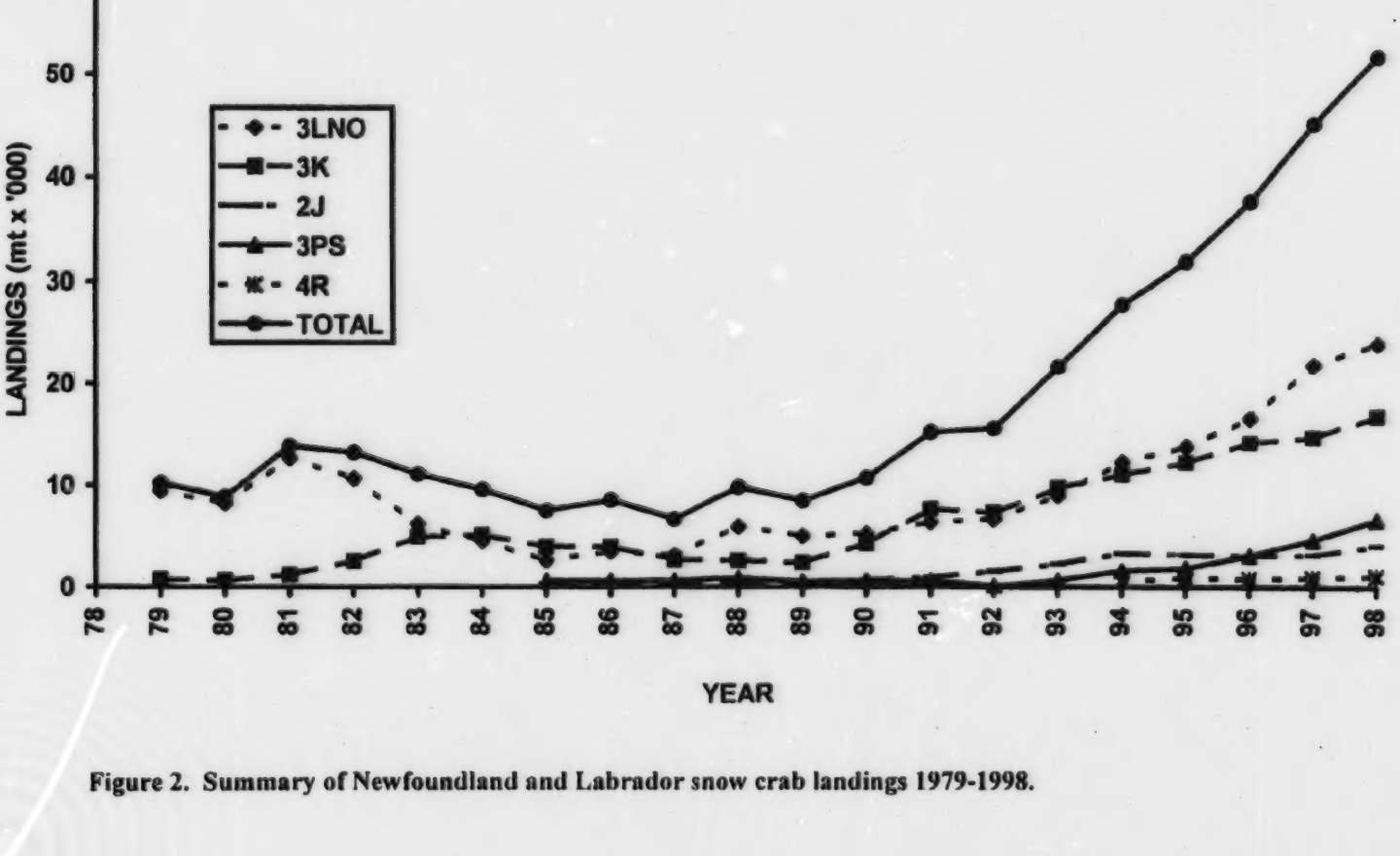

Figure 2. Summary of Newfoundland and Labrador snow crab landings 1979-1998.

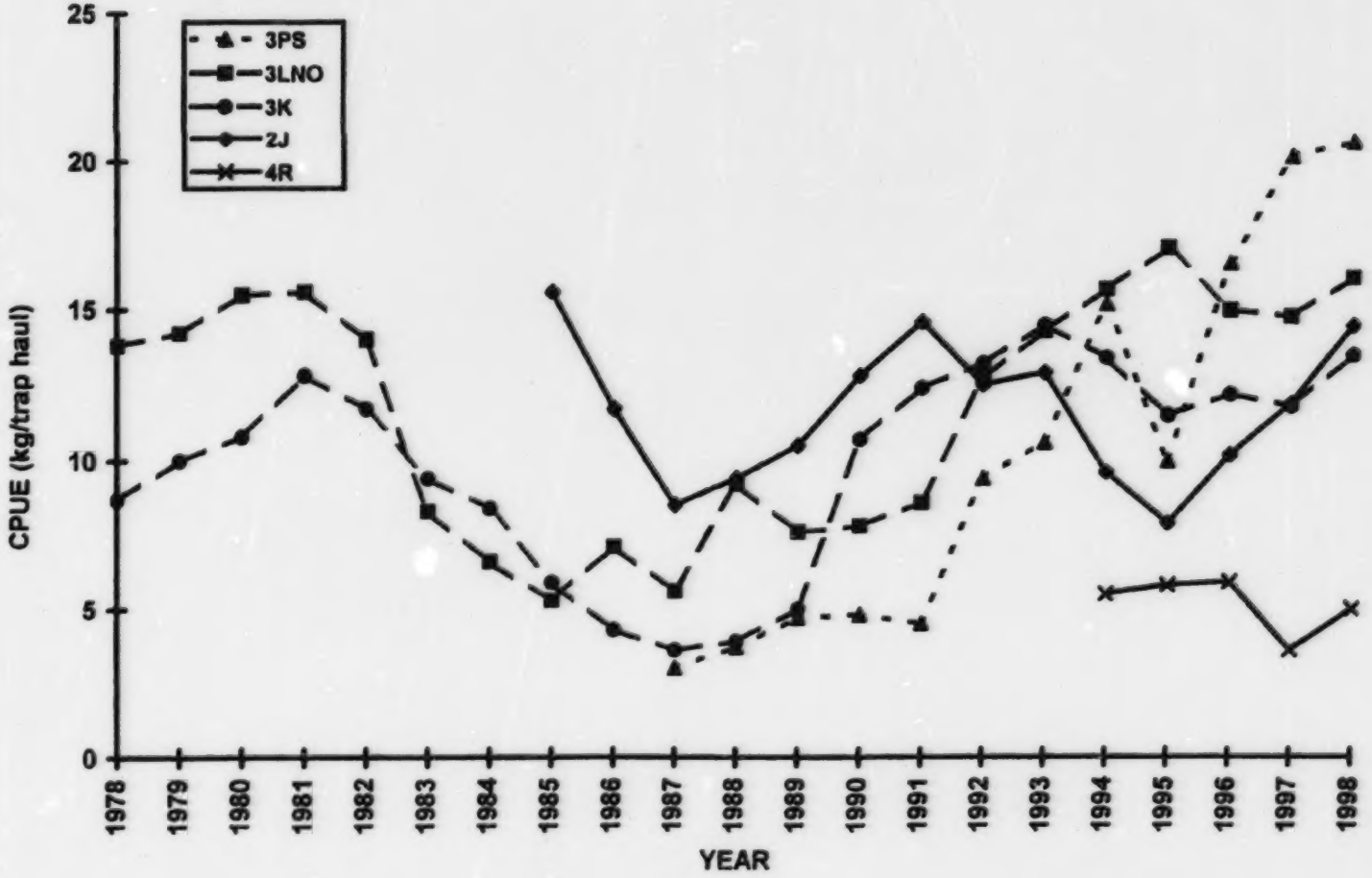

Figure 3. Summary of CPUE (kg./trap haul) by NAFO division, 1978 - 1998.

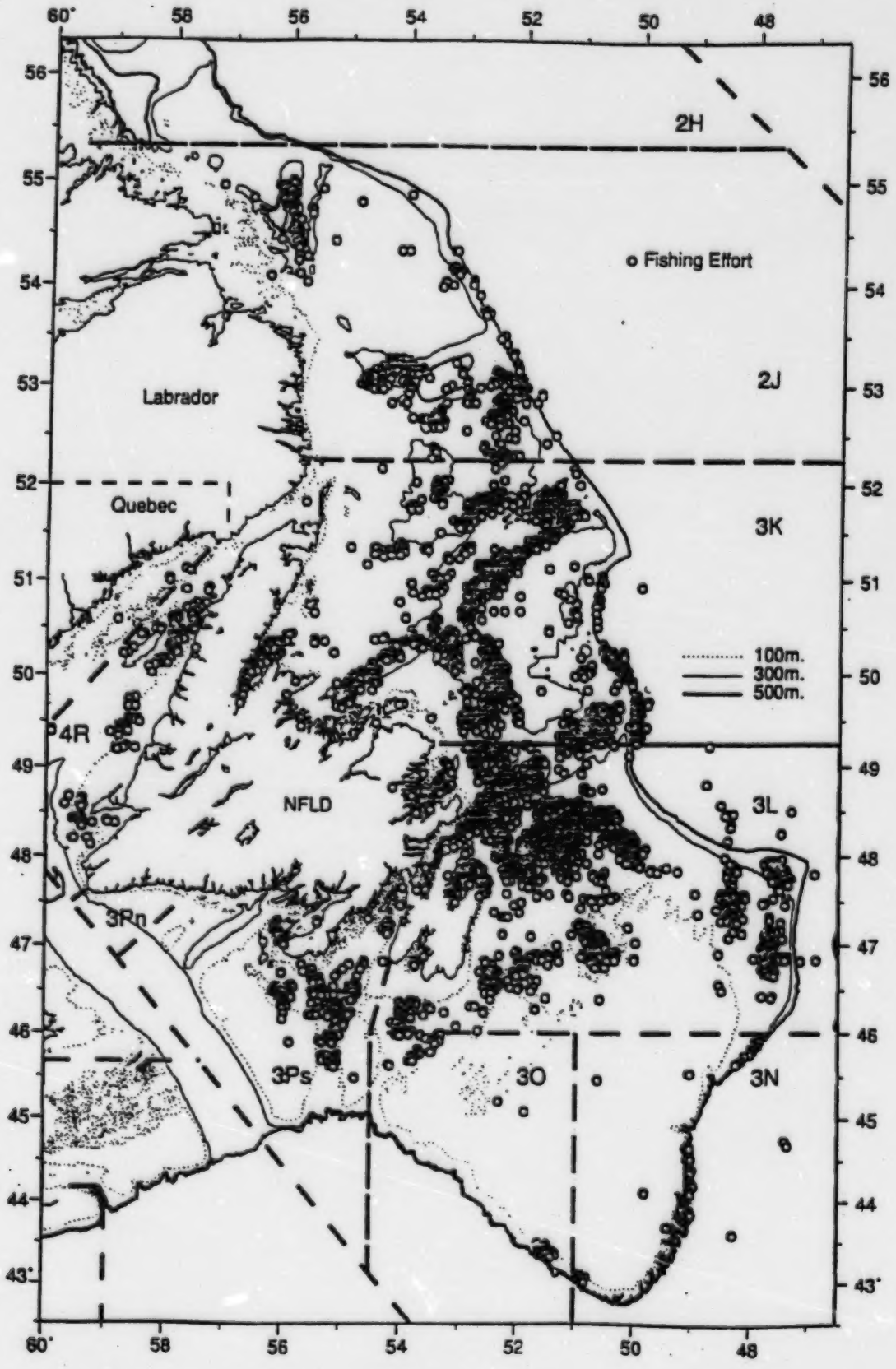

Figure 4. Distribution of snow crab fishing effort. 1998.